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MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF CLARK UNIVERSITY.

COMMUNICATED BY EDMUND C. SANFORD.

XV. AUTOMATIC MOVEMENTS OF THE LARYNX.¹

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Automatic movements of the hand are demonstrable in many normal subjects, and with a little cultivation can be brought nearly or quite to the verge of automatic writing.² What is true of the hand is of course measurably true of other members, the chief requisites being, apparently, a high degree of mobility in the member and a temporary abstraction, or at least inattention to it, on the part of the subject. These requirements are very well fulfilled by the vocal mechanisms, which are, perhaps, the most mobile in the body, and at the same time are out of the visual field, and function with a minimum of direct attention. A further interest attaches to their activities on account of the large part which language plays in the ordinary course of thought. The experiments of Hansen and Lehmann³ show clearly the tendency of these organs to automatic activity, and the experiments about to be described add confirmation. The chief interest of the latter, indeed, lies in showing that such movements are very common with normal people, and are comparatively easy of demonstration.

The essential part of the apparatus used was nothing more than two tambours: a receiving tambour applied to the larynx, and an inscribing tambour writing upon the smoked surface of

¹ The experiments recorded in this paper were made in the spring of 1897.

² Binet: Double Consciousness in Health, *Mind*, XV, 1890, 46-57. Jastrow: A Study of Involuntary Movements, *Amer. Jour. Psy.*, IV, 1892, 398-407; V, 1892, 223-231. Tucker: Comparative Observations on the Involuntary Movements of Adults and Children, *Ibid.*, VIII, 1897, 394-404. Solomons and Stein: Normal Motor Automatism, *Psy. Rev.*, III, 1896, 492-512. Stein: Cultivated Motor Automatism, *Ibid.*, V, 1898, 295-306.

³ Hansen and Lehmann: Ueber unwillkürliches Flüstern, *Wundt's Philos. Studien*, XI, 1895, 471-530.

a kymograph drum. The inscribing tambour was of the ordinary Marey pattern; the receiving tambour was a home-made one of about the same size, on the rubber face of which a cork—trimmed to receive the tip of the larynx—had been fastened with rubber cement. The rubber face of this tambour had been further stiffened (as in other of the Marey instruments) by a weak spiral spring within. In order to hold this tambour in place against the larynx it was necessary to provide a special means of support. This was secured as follows: Two brass rods were fastened on the sides of an old stiff hat in such a way that they came down beside the cheeks of the subject when the hat was on his head, and extended below the level of his larynx. These were connected near their lower ends by a cross rod securely clamped to both. To this cross rod was clamped in turn a thin lead rod, near the end of which the receiving tambour was fastened, the lead rod, by its partial flexibility, making the regulation of the pressure of the tambour on the larynx fairly easy.¹ During the experiment the subject was comfortably seated in a reclining-chair with his head supported. On the drum a time curve in half seconds was traced by a third and independent tambour.

The usual course of experimentation was as follows: The subject having taken his place in the chair and the apparatus being adjusted, he was told to remain passive and avoid mental effort (or sometimes to keep his thought as much as possible in visual images) while a "normal" tracing should be taken. He was next asked to recite some familiar poem mentally, (or the Lord's prayer, if no poem was in mind,) while a similar tracing was taken for comparison. He was then asked to whisper the same selection, and tracings of this and of other variations of the task were taken till the drum was full. In some cases tracings were also taken when the subject read to himself from a book mechanically supported at the proper distance from his eyes.

In the accompanying plate is reproduced a portion cut from a sheet of such tracings. The curves read from left to right and were taken in pairs (time curve and larynx curve) successively from the bottom upward. Beginning at the bottom the first pair shows a "normal" curve in which the irregularities are due chiefly to pulse and respiration. The crowding of the points in the time curve about midway of the portion shown betrays a tendency of the drum to stick at that point—a matter

¹The apparatus was evidently rough, but, as it was thus calculated rather to fail in recording the finer laryngeal movements than to exaggerate them, such records of movements as were obtained are not invalidated by it.

Normal.

Silent Reading
of Hiawatha.

Time.

Mental Reci-
tation of the
Lord's Prayer.

Time.

Actual
whispering.

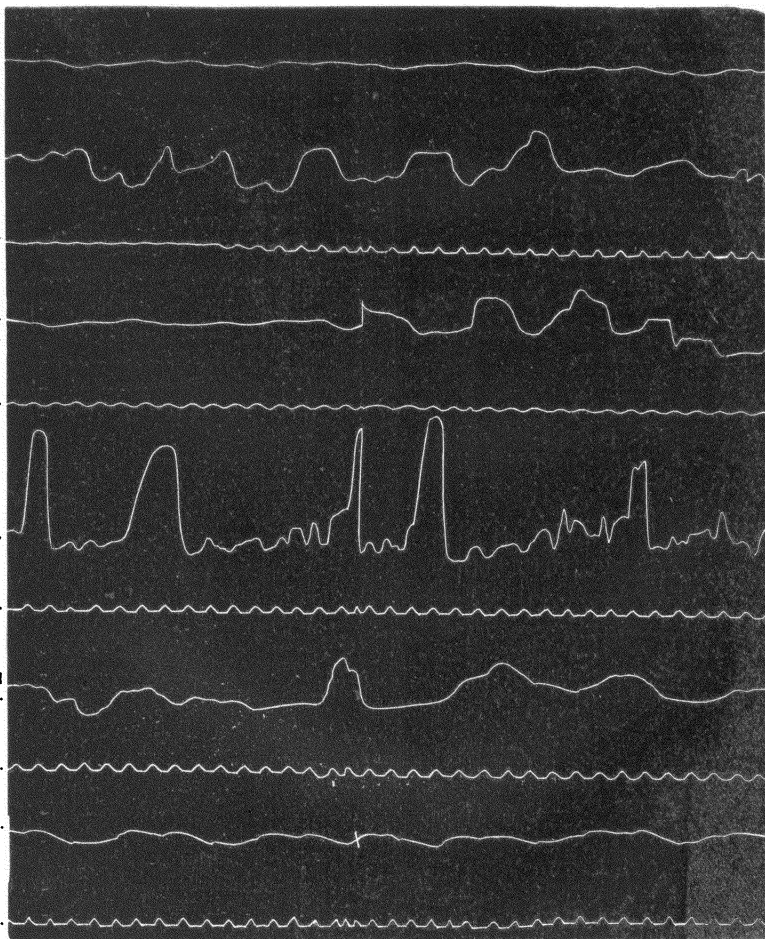
Time.

Mental
Recitation.

Time.

Normal.

Time.



of no special importance here, but one that would have to be taken into account in any minute study of the curves. The second pair shows the greatly increased laryngeal movements accompanying mental recitation of a portion of a poem. The third shows the still greater disturbances accompanying whispering. The fourth pair is interesting as showing how the laryngeal movements vary with the energy of the inner speech. Up to about the middle of the portion shown the curve is indistinguishable from a "normal," beyond this point the effects of the laryngeal movement are very marked. During the first part the subject was repeating the Lord's prayer to himself in a perfunctory way without thinking what he was doing. It then occurred to him that, perhaps, this was not what the experimenter wanted and he thought of himself as repeating it before an audience at church; with what result is evident. The fifth pair shows the curve obtained from silent reading in "Hiawatha," and the last (single) curve is a final "normal." The subject was for the most part unaware of the movements of his larynx during the taking of the tracings of inner speech, noticing them but "once or twice."

It is only fair to say that the tracings shown in this plate are not average tracings, but are selected as showing the differences in question in a decided manner; they are not to be regarded as unique however. Forty sittings were taken in all, with twenty different subjects. Of these, sixteen were university students, three were boys between fifteen and nineteen years of age, and one was the university mechanic. Of the forty sittings, eighteen show clearly marked automatic movements of the larynx in some or all of the tracings; eleven show smaller but still distinguishable variations; while the remaining eleven show hardly any difference between the "normals" and the other curves. Of the twenty subjects, fifteen show automatic movements. Four of the remaining five do not show movements even in whispering, and so could hardly be expected to show them with wholly silent speech. The remaining subject served but a single time and tried successfully to suppress all movements. The extent of the movements differed considerably, not only from subject to subject, but with the same subject at different times, being hardly distinguishable at one time and fairly marked at another—a result attributable in part to the difficulty of getting the receiving tambour properly adjusted and partly to different conditions in the subject himself, especially to the energy of his mental speech.

Taken together with the experiments of Hansen and Lehmann these experiments seem to put it beyond question that automatic movements of the speech organs do take place and are far from uncommon.